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Provider Incentives and Delivery of Developmental Goods

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# Provider Incentives and Delivery of Developmental Goods\*

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## ABSTRACT

*We use a donor-provider-agent framework to study the delivery of developmental goods (i.e. aid, credit, technology transfer to poor). The need to provide incentives for the intermediate provider has been a key issue in the recent academic as well as non-academic discourses. We show that the use of high-powered incentives can lead to breakdown of communications between the provider and the agents. We study the interplay between incentives and communication failure in the presence of motivated providers who derive benefits from helping the disadvantaged.*

Key Words: Incentives, Communication, Motivated Provider, Developmental Goods.

*JEL* Classification: D03; D82-83; J33; F35

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# 1 Introduction

Effective delivery is a critical component of development efforts. This paper examines issues related to the provisioning of developmental goods identified by two distinctive features: non-commercial intent and reliance on non-price allocation mechanisms. Examples of these are transfer of modern technology, technological know-how, loans and grants as well as aid to the poor. We adopt a donor-provider-agents framework where the donor makes resources available to the provider for delivery to the agents (recipients). Hence in our model it is the provider who interacts with the agents.<sup>1</sup> The objective of our paper is to analyze the role of the provider's incentives in such a delivery system.

Various aspects of the delivery system have come under scrutiny in recent times. A key recurring theme that has been emphasized in the literature is the need to incentivise the providers. In the context of foreign aid, it has been pointed out that the providers (aid intermediaries) may not have the right kind of incentives to see that aid is spent effectively. Easterly and Pfutze (2008) note that "An ideal aid agency must find answers to the problem of zero feedback and *unclear objectives*". In the context of microfinance, great deal of attention has been paid to the issue of incentives for loan officers to achieve the organizational goals of the Microfinance Institutions (MFIs). Similar issues arise in the context of government bureaucracy too.<sup>2</sup>

We look at communication and information flows between the various layers of the delivery system and the role of provider incentives in improv-

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<sup>1</sup>This framework is certainly not unique to the development context; it is used to study other domestic programmes like the provisioning of health services, education and many other public goods.

<sup>2</sup>See Dixit (2002), Tirole (1994), and Wilson (1989) amongst others for the analysis of agency and incentives within government organizations. Maertens et al. (2002) contains an excellent collection of articles on various aspects of agency relations within the aid context. Armendariz de Aghion and Murdoch (2004) reviews some of the incentive and agency issues.

ing these.<sup>3</sup> An excellent example of an aid project failing completely due to poor information flow is the aid project in a mountainous region of Lesotho (Easterly (2003)). To help farmers in the mountainous region get better returns on their produce, the project conceived of building roads to link the region with other areas. However the main effect of this was to allow grains into the region and drive the farmers out of business as agriculture was not inherently conducive to the mountainous region. Similar examples can be found in the context of microfinance too. A major crisis broke out in March 2006 when around 50 MFI branches in Andhra Pradesh (a State in India) were closed by the Government because of complaints against practices of these organizations. Some authors, while analyzing this incident, commented on how indiscriminate lending was ‘making a debt trap’ for the poor.<sup>4</sup> It is conceivable that several individuals who (ex ante) had very small chance of repaying the loans also entered into debt contracts. In more general contexts, the recent literature on participatory development can also be viewed as attempts to adopt development practices where there is better information flow (about local preferences) between the recipients and the providers.<sup>5</sup> The objective of our paper is to argue that in certain situations adoption of the high-powered incentives can lead to communication failures and hence would be counter-productive.

We focus on a class of transfers where realization of the benefits is skill sensitive. This could simply be a loan for a small project where the success depends on the entrepreneurial skills of the agent receiving the loan. Be it social banking or microlending, the objective of these transfers is to enable

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<sup>3</sup>Information and communication are, of course, important in any organization. Generally, the economics literature emphasizes either the incentives or the communication aspects in the organization but does not look at both. See Mookherjee (2007) for a discussion of some of the issues in the context of organizational design.

<sup>4</sup>See Shylendra (2006) and Kumar (2006) for detailed accounts and analysis of this incident. There is also a related literature on mission drift which looks at problems associated with the MFI’s objective of outreach and profitability. See Copestake (2007).

<sup>5</sup>See Platteau (2009).

the poor and unemployed get better access to funds for entrepreneurial initiatives (add ref.). Since the scheme is skill sensitive, it may not achieve the desired objective if loans are distributed randomly. This is also true for situations of technology transfers like the use of High Yielding Varieties (HYV) seeds. The HYVs are certainly more productive but they are also more sensitive to know-how and resource base of the recipient farmers. In all these cases the objective is to transfer resources or technologies to agents with certain minimum level of skills. If the agent's skill level (or other relevant attribute) is not commonly observed, there can be informational problems. The severity of the problem can be gauged by the fact that in these situations, even though some types of agents are likely to worse off than their present status, they end up receiving the transfers.

Consider for instance a farmer is currently earning some fixed deterministic income using traditional technology and is considering the adoption of modern technology with stochastic outcomes.<sup>6</sup> Are there situations where agents with lower expected income can also switch to the modern technology? For rational farmers this can happen only if they do not have full information about the probable outcomes associated with the modern technology. The question then is how to provide them with this information in a credible manner. In our example, such information can be made available by the player called the provider to whom the donor provides the funds for disbursement. Following the tradition of strategic information transmission, we model the information transmission from the provider to the agent as a cheap talk game. It turns out that while providers can successfully communicate to the relevant agents in the absence of any incentives, the communication process breaks down in the presence of high powered incentives for providers. For a large class of incentive schemes, the provider's

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<sup>6</sup>Note that in any such modernization process it is not possible to rule out lower income ex-post. But adoption of the modern technology dominates the current practice in an expected sense.

announcement regarding the non-suitability of the transfer for certain types (low success probability of modern technology) is non-credible. Hence even though the relevant information is available, the agents do not benefit from it and we can obtain highly inefficient outcomes.<sup>7</sup>

Suppose the provider must incur some cost to acquire the relevant information before it can communicate. Let us assume that this cost is non-verifiable and hence can not be contracted. In that case, we have a *Catch-22* type situation. It is possible that we need to have an incentive system to induce the provider to acquire information, but by the creation of this incentive we render the process of communication ineffective. The situation is improved when we have some motivated providers (a la Besley and Ghatak, (2005)) that would acquire and communicate this agent relevant information. These motivated providers are driven by the mission to help the disadvantaged (low skilled in our context) and derive some private benefit from doing so. However, we also have non-motivated or typical providers who respond only to pecuniary incentives. The agents have no way of knowing whether they face a motivated or a typical provider. In the absence of any high-powered incentives, the presence of these typical providers do not affect communication between motivated providers and the agents, but with the introduction of incentives communication breaks down due to the presence of the typical providers. Hence, in presence of incentives, the motivated providers are of little help.<sup>8</sup>

Our paper is related to several strands in the literature and we draw on many of these sources. The role and significance of various types of motivations has received attention by several economists recently. Besley

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<sup>7</sup>This outcome has the flavour of the widely known phenomenon called the ‘Dutch Disease’ where countries become worse off due to certain kinds of transfers. In our case, agents are worse off in an expected sense.

<sup>8</sup>This result has the flavor of the earlier crowding out literature. In the market context introduction of market mechanism eliminates non-market informal mechanisms (Stiglitz ??). In individual context, pecuniary incentives may crowd out non-pecuniary incentives (Titmuss 1970)

and Ghatak (2005) point out that it might be cheaper to address the moral hazard problem of inducing effort by careful matching of motivated agents than the use of high powered incentives. In our case, reliance on motivated agents may be the only way of solving the issue of information acquisition and communication. The claim that introduction of incentives can be counter-productive is not new. A common source of this is the demanding informational requirements that the designer faces. But a recent literature shows that even when incentives are appropriately designed, we cannot be certain of efficient outcomes since these extrinsic motivations might lead to crowding out of intrinsic motivations.<sup>9</sup> In several Principal-Agent experimental settings, it has been noted that stronger incentives and control induce weaker performances by the agent. Benabou and Tirole (2006) and Ellingsen and Johannesson (2008) show that when agents care for esteem, material incentives may undermine esteem incentives. In our case, stronger material incentives do not crowd out motivational incentives of these providers, but material incentives enable the non-motivated providers to add noise to the communication process.

Signalling plays a key methodological role in many of these models of motivations. Individuals have private information regarding own characteristics and they try to signal these through generosity, superior performances or esteem enhancing acts.<sup>10</sup> Our model also involves signalling by the provider (and not the agents) but it is costless. In that sense it is closer to the literature on strategic information transmission and cheap talk (Austen-Smith (1994), Crawford and Sobel (1992), Farrell (1995), Krishna and Morgan

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<sup>9</sup>See Benabou and Tirole (2003, 2006), Sliwka (2007), Gneezy and Rustichini (2002), Ellingsen and Johannesson (2008) among others.

<sup>10</sup>It is not the case that only agents engage in signalling. There are cases where the principal also signals (through its choice of control, trust, incentive provision) about the private information held by the principal. In Slikwa (2007), the principal chooses the level of control over the agents to signal about the average level of trustworthy fair agents in the population. In Ellingsen and Johannesson (2008), the principal signals its altruistic characteristics.



(2001)). It is well known that divergence of interests between the sender (provider) and receiver (recipient) can lead to communication failure. Our paper uses this intuition in a simple setting but with the added features that the sender has to acquire information before communicating and that the nature of incentive schemes for the provider has the potential to affect the degree of divergence in interests.

Lastly, we do not attempt to make any general claim about the usefulness or otherwise of incentive schemes. Ours is an extremely stylized model with two sided asymmetric information, which we elaborate on in the text.<sup>11</sup> It is known that in such settings it is difficult to sustain efficient outcomes no matter what incentive structure or mechanisms one uses. However, we have introduced the possibility of communication and show that some efficient outcomes can be achieved in the presence of motivated providers. The interplay of incentives and communication failure is the novel feature of our analysis.

## 2 The Model

We consider a simple variant of the standard principal-agent framework to study the delivery of developmental goods. Let there be *Donor* who provides a fixed amount of funds denoted by  $M$  to a *Provider* who then disburses the funds to the *Recipients* (or *agents*). Besides making finance available, the donor also chooses the compensation scheme for the provider. Beyond that, the donor has no strategic role and most of the paper is about the interaction between the provider and the agent.

The available finance is to be used to fund several projects to be undertaken by the agents. Each project costs an amount  $T$ , hence a maximum of  $\frac{M}{T}$  projects can be financed. Note that the funding need not only be cash

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<sup>11</sup>The provider does not know the skill level of the recipients and the recipients do not have full knowledge about their success probabilities which the provider does.

trasfers, it can also take the form of transfer of technology of production. We discuss the details of this transfer technology, payoffs, and strategies of the provider and agents below.

## 2.1 Agents

We assume that there are two types of agents – high skill ( $h$ ) and low skill ( $l$ ). The total population is denoted by  $N = n_h + n_l$  where  $n_h$  and  $n_l$  are the number of high type and low type agents respectively. We denote the fraction of  $h$ -type in the population by  $\lambda$ . Each agent can supply  $L$  units of labor in an inelastic manner and is assumed to be risk neutral. The transfer  $T$  enables the agents to pursue a project. The probability of project success for the high type agent is given by  $p_h > 0$ . For the low skill agents, on the other hand, the project success probability depends on several other factors which are summarized by the state of nature  $\theta$ . There are only two possible states  $\theta \in \{G, B\}$  where  $G$  denotes the good state and  $B$  the bad state respectively. The project success probabilities of the low skill agent are given by  $p_{lG}$  and  $p_{lB}$  with  $p_h > p_{lG} > p_{lB} > 0$ . It is assumed that agents and the donor do not know the realization of the true state and the common prior probability of  $\theta = G$  is given by  $\mu$ . We assume that the  $l$ -type agents are aware of this value.

In the absence of the project (which can be interpreted as the subsistence sector using traditional technology) output does not depend on skill type and is given by

$$X_i = \alpha L \quad i = h, l \quad (1)$$

where  $\alpha > 0$  and  $L$  is the labor input into the production process. Undertaking the project is risky in the sense that it results in zero output in the failure state and  $Y_i > 0$  when it is successful. Output in the successful state and expected outputs for both types are shown below.

$$Y_i = \beta L \quad (2)$$

$$E(Y_h) = p_h \beta L \quad (3)$$

$$E(Y_l \mid \theta = G) = p_{lG} \beta L \text{ and } E(Y_l \mid \theta = B) = p_{lB} \beta L \quad (4)$$

Note that  $\beta > \alpha$ . We assume that  $p_h \beta \gg \alpha$ , but  $p_{lG} \beta > \alpha > p_{lB} \beta$ . Thus when  $\theta = G$ , both types are better off (in an expected sense) by undertaking the project but the  $h$ -type is more likely to succeed. However when  $\theta = B$  the low skill type is better off using traditional technology and not undertaking the project. To make things interesting, we consider the case where the prior  $\mu$  is such that the low types will choose to undertake the project, i.e.,

$$\{\mu p_{lG} + (1 - \mu) p_{lB}\} \beta > \alpha \quad (5)$$

## 2.2 Provider

The provider distributes the funds to the agents but is unable to identify the different skill types. The provider can learn the true state  $\theta$  but only after putting costly effort  $e$ . To begin with we consider a provider whose payoff is given by  $U = Z - d(e)$ , where  $Z$  is monetary compensation provided by the donor and  $d(e)$  is disutility of effort.<sup>12</sup> We assume that effort is binary with  $e \in \{0, 1\}$  where  $d(0) = 0$  and  $d(1) = E$ . The true state can be learnt by the provider when he chooses  $e = 1$ . We assume that effort is observable but not contractible.<sup>13</sup> The provider's reservation utility is denoted by  $\bar{U} \geq 0$ . The provider is also assumed to be risk neutral. After learning the true realization of  $\theta$ , the provider can send a fully informative costless signal

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<sup>12</sup>It is assumed that the donor sets aside the provider's compensation and therefore it does not affect  $M$ . Also in the next section we consider motivated providers.

<sup>13</sup>If effort were unobservable, the communication game will have to admit possibilities that the provider can announce  $G$  or  $B$  without any knowledge of the true state.

$S \in \{G, B\}$ . It should be clear that the donor has to design a suitable incentive scheme for the provider so that the latter undertakes desired effort to gather information about the the state of nature.

### 2.3 Information and Time Line

Recall that neither the donor nor the agents know the true realization of  $\theta$  while the provider learns it through costly effort. We assume that the compensation scheme chosen by the donor  $Z(\cdot)$  is commonly known. In the model the low skill agents know the success probabilities associated with the good and bad state, but do not know  $\theta$ . After learning the the true state the provider can communicate this by sending a signal  $S \in \{G, B\}$ . Hence we have a two sided asymmetric information situation, but there is scope for information revelation by the provider in a costless communication game. Finally, once all projects are undertaken and outcomes realized, the donor can verify the total number of successful/failed projects.

The sequence of moves in this game is as follows.

1. Donor provides  $M$  to finance  $(\frac{M}{T})$  projects and specifies the provider's compensation scheme  $Z$ .
2. Provider chooses  $e$  and makes an announcement  $S \in \{G, B\}$ .
3. Agents update their belief about  $\theta$  and choose whether to apply for the project.
4. Provider selects (randomly) a subset of all applicants and transfers amount  $T$  to each of the selected agents. Let  $n^*$  be the total number projects funded,  $n_h^*$  and  $n_l^*$  denote the number of high skill and low skill agents selected to undertake the project respectively.
5. Outputs are realized and the Donor learns the number of successful projects ( $m$ ).

We are interested in studying the impact of various incentive schemes on the interaction between the provider and agent. Hence our equilibrium

definition essentially captures the interaction in stages 2-3. An equilibrium is given by  $\{e^*, S^*, a^*\}$  where  $e^*$  denotes the choice of effort and  $S^*$  is the signal. The agent's choice is denoted by  $a : \{G, B\} \longrightarrow \{A, NA\}$ . The agents choose whether to apply ( $A$ ) or not apply ( $NA$ ) based on their posterior belief  $\sigma(S, \mu) : \{G, B\} \times [0, 1] \longrightarrow [0, 1]$ . Next we study the Perfect Bayesian Equilibria (PBE) of this game (stage 2-3).

### 3 Results and Analysis

In this section we first illustrate the role of communication in the game. Then we examine efficiency and introduce the motivated provider. The last part of this section deals with developmental objectives.

#### 3.1 Communication

In order to demonstrate the importance of communication we begin with the payoff matrix shown below. Observe that the low skilled agent who is the column player chooses whether to apply or not in the two different states. The first element in each box refers to the provider's payoff and the second refers to the low skilled agent's payoff. These payoffs are for illustration purposes only and are not strictly derived from the payoff specifications discussed earlier. The high skilled agent is missing from the analysis because their choice is not affected by the provider's announcement. The payoffs capture the idea that the agent is better off choosing  $NA$  in the bad state, and prefers  $A$  in the good state. In the bad state, the provider also prefers the agent to choose  $NA$ . However, in the good state the provider's preference over the agent's choice depends on the relationship between  $x$  and  $x'$ .

	A	NA
$\theta = G$	$x, X$	$x', 0$
$\theta = B$	$0, -Y$	$3, 0$

### Game 1

Suppose,  $x \geq x^{\prime}$ , it is clear that communication is informative. It is easy to verify that we have a PBE where

$$\begin{aligned} s^*(G) &= G, s^*(B) = B, \\ a^*(B) &= NA, a^*(G) = A, \\ \sigma(G) &= 1, \sigma(B) = 0 \end{aligned} \tag{6}$$

It is of course true that we also have the uninformative ‘babbling’ equilibrium where  $\sigma(s, \mu) = \mu$ , for all  $s$ . The agent learns nothing from the announcement by the provider and the provider’s announcement  $s^*(G) = s^*(B)$ . We do not go in to the equilibrium selection issues here and assume that whenever the fully informative equilibrium exists, player will choose to play according it.

Now consider a minor modification of the payoffs to the provider such that  $x < x^{\prime}$ . In the good state  $\theta = G$ , the provider’s payoff is higher whenever the agent chooses  $NA$ . Now, the announcement of  $s(B) = B$  is not credible because the agent realizes that the provider would like the agent to believe so even when  $\theta = G$ . Hence the equilibrium described in equation (6) cannot be sustained. In fact, the only PBE in this case is the uninformative babbling equilibrium where the agent chooses  $A$  irrespective of the announcement.

### 3.2 Efficiency

Suppose that for a given  $M$ , the donor is interested in maximizing total benefits to the recipients. Since the agent’s payoff from not undertaking the project is fixed, this will amount to maximising the expected output  $\{p_h n_h^* + (\mu p_{lG} n_{lG}^* + (1 - \mu) p_{lB} n_{lB}^*)\} \beta$  subject to the constraints  $E(Y_i | \theta) \geq X_i$ . These constraints can be viewed as interim participation constraints and

refer to this outcome as the interim efficient outcome. The solution is given by

$$\begin{aligned} n_h^* &= n^* = \frac{M}{T}, \quad \text{for } n_h \geq \frac{M}{T} \\ n_h^* &= n_h, \quad n_{lG}^* = \frac{M}{T} - n_h, \quad \text{and } n_{lB}^* = 0, \quad \text{for } n_h < \frac{M}{T} \end{aligned} \quad (7)$$

Note that this does not involve welfare loss for the low skilled agents in the bad state. Of course, ex post inefficiency cannot be ruled out because of the non-deterministic nature of the output. Interim efficiency requires that some amount of funds will remain unutilised when  $\theta = B$ , and  $n_h < \frac{M}{T}$ . But if we drop the above constraints and require complete utilization of  $M$  then the solution would be

$$n_h^* = n_h, \quad \text{and } n_{l\theta}^* = \frac{M}{T} - n_h, \quad \theta = G, B, \quad \text{for } n_h < \frac{M}{T} \quad (8)$$

For the remainder of the paper will focus on the case when  $n_h \geq \frac{M}{T}$  as it is sufficient to illustrate the trade-offs costly communication and incentives of the provider. Can the donor achieve this outcome as described in (6)? The only way this outcome can be achieved is by preventing the  $l$ -types from applying in the bad as well the good state, and it is impossible to achieve this. Recall that in the absence of any communication about the realized state, our assumptions about the prior belief  $\mu$  implies that both types will apply to undertake the project. For the low skill types to revise their prior belief we need the provider to engage in costly effort and acquire information about the realized  $\theta$ , and then credibly communicate this information. There is a basic tension between these two. Since effort is not contractible the provider can only be incentivized by making their compensation dependent on the outcomes. The number of successful projects  $m$  is known ex post. Hence the provider's compensation can be based on a scheme where  $Z'(m) >$

0. Since the compensation scheme is assumed to be common knowledge, the payoff matrix in the communication game between the provider and the  $l$ -type agents will be similar to the payoff matrix specified in Game 1 with  $x < x^l$ . We know that the only equilibrium in this game is the uninformative babbling equilibrium. *Hence the benefits of communication are non-existent and the provider is better off not acquiring any information.* For communication to be effective we need  $Z'(m) = 0$ , and for the provider to acquire information we need  $Z'(m) > 0$ . Clearly it is not possible to have both simultaneously. We summarize this in our first proposition.

**Proposition 1** *Let  $n_h \geq \frac{M}{T}$ . For any compensation scheme  $Z(m)$ , both types apply in all states and  $n_h^* < n_h$ ,  $n_{l\theta}^* > 0$ , for  $\theta = G, B$ .*

### 3.3 Motivated Providers

Now suppose that we have some providers who are mission-oriented (for more on this see Besley and Ghatak (2005)). These providers derive positive private benefits which are Rawlsian in nature. In other words, they seek to maximize the expected benefit to the most disadvantaged group – the low skilled agents. These benefits are private to the provider in the sense that they are independent of the compensation scheme assigned by the donor. As discussed earlier, we focus on the interim payoffs.

In state  $\theta = G$ , the (marginal) expected benefit to the  $l$ -type will be  $(p_{lG}\beta - \alpha)\frac{n_l}{N} > 0$ . The provider's private benefit is maximized when  $n_l^*$  is maximized. On the other hand, in state  $\theta = B$  the (marginal) expected benefit to the low skilled type will be  $(p_{lB}\beta - \alpha)\frac{n_l}{N} < 0$  and this is maximized when  $n_l^* = 0$ . Thus the motivated provider's private benefits in our problem are state dependent. We can rewrite the motivated provider's payoff as

$$U^M = Z - d(e) + I(\theta)n_l^*k - J(\theta)n_l^*k', \quad k' > k > 0 \quad (9)$$



where  $I = 1$  when  $\theta = G$ , and zero otherwise. Similarly,  $J = 1$  when  $\theta = B$  and zero otherwise. This implies that the motivated provider would like to screen out the  $l$ -types in the bad state since they are better off using traditional technology. From the above utility function it also follows that for  $\theta = G$ , in the absence of any incentives, the provider would prefer the  $l$ -types to undertake the project. An example of such motivated providers would be loan officers working for a MFI who would not advance loans to someone that is most likely to be severely indebted; not because the MFI's repayment rates are going to be adversely affected, but because the client is strictly worse off (in an interim sense).

In this section we assume that the population of providers consists of both the typical providers and mission oriented providers. We assume that the fraction of motivated providers is  $\delta$ . Recall that the typical providers simply maximize  $Z - d(e)$ . First suppose that there are no incentives for the providers, i.e.,  $Z$  is fixed and not performance based. Then with probability  $\delta$ , the provider will choose  $e = 1$  and communicate the realized state to the agents. With the complementary probability  $(1 - \delta)$ , the provider does not observe the realized state as effort is costly. Since the provider's effort is observable, when an agent receives a signal, it knows that the signal must be from the motivated agent.

We can show that there is an equilibrium where the motivated provider truthfully conveys the state and the  $l$ -types do not apply in the bad state. Note that given the objective function of the motivated provider, the communication game resembles Game 1 with  $x > x^*$ . This means the provider would like the  $l$ -types to apply in the good state but not in the bad state making their announcement credible. Hence the low skilled agent chooses their strategy as follows:  $a(G) = A$ , and  $a(B) = NA$ . It is easy to verify that the typical type provider does not have any incentive to deviate and acquire information to take advantage of the credible communication. Since

compensation  $Z$  does not depend on the outcome, doing so would simply lead a reduction in equilibrium payoff by  $d(1) = E$ . So in this setting, with probability  $\delta$  we get the outcome where only the high types apply in the bad state and with probability  $(1 - \delta)$ , we get the inefficient outcome where all types apply in both states. However, allocation of projects is different from (6). In the good state both high and low skilled agents have equal probability of receiving the transfer  $T$ . In the following we refer to the motivated provider using and the subscript  $\rho$  and to the typical provider by the subscript  $\tau$ .

Equilibrium strategies are given by

$$\begin{aligned} e_\rho^* &= 1, e_\tau^* = 0, \\ s(G) &= G, s(B) = B, \\ a_h &= A; a_l(G) = A \text{ and } a_l(B) = NA. \end{aligned} \tag{10}$$

The corresponding equilibrium outcome is given by

$$\begin{aligned} n_h^*(\theta = G) &= \lambda \frac{M}{T}, \quad n_l^*(\theta = G) = (1 - \lambda) \frac{M}{T}, \\ n_h^*(\theta = B) &= \frac{M}{T}, \quad n_l^*(\theta = B) = 0. \end{aligned} \tag{11}$$

If  $\tau$  type provider deviates and choose  $e_\tau = 1$ , it can send the signal  $S(G) = S(B) = B$ . Given the agents' strategies this would lead to  $n_h^* = \frac{M}{T}$  implying that the number of successful projects is highest. However, since  $Z$  is fixed, this will mean a lower payoff and hence deviation unprofitable. We summarize this in the following proposition.

**Proposition 2** *Let  $n_h > \frac{M}{T}$  and  $Z(m) = Z$ . Suppose the motivated provider's payoff is given by (9). Then there exists an equilibrium where the motivated provider chooses to acquire information about the true state and communi-*

*cates truthfully. The high skilled agents always apply, the low skilled agents apply only when the announced state is good. The non-motivated provider chooses not to acquire any information.*

Now suppose the incentive scheme has the property that  $Z'(m) > 0$ . For the motivated providers this does not change any of the equilibrium strategies for sufficiently large values of  $k$  and  $k'$ . Consider the equilibrium strategies given in (10). The motivated provider's effort choice is still given by  $e_p = 1$ . It is clear that they will choose to communicate truthfully in the bad state. But will it choose  $s = G$  when the realized state is  $G$ ? Depending on  $\lambda$ ,  $Z(m)$  can be lower according to the equilibrium strategy in (10). But it is easy to show that for  $k \geq k_\lambda$  the motivated provider will not deviate to  $s = B$ , where  $k_\lambda$  is given by<sup>14</sup>

$$Z(p_h \frac{M}{T}) = Z(p_h \lambda \frac{M}{T} + p_{lG}(1 - \lambda) \frac{M}{T}) + (1 - \lambda) \frac{M}{T} k_\lambda \quad (12)$$

However, the incentive scheme has a significant impact on the typical provider's strategies. Given the strategies of the motivated provider and the agents, the typical provider's payoff from deviation to  $e_\tau = 1$  and  $s(G) = B$  will lead to a higher payoff if the following is satisfied.

$$Z(p_h \frac{M}{T}) - E \geq Z(p_h \lambda \frac{M}{T} + p_{lG}(1 - \lambda) \frac{M}{T}) \quad (13)$$

It is clear that for given effort level and  $\lambda$  this condition depends on the slope of the compensation function  $Z$ . The slope can be interpreted as the power of the incentive scheme, with a higher slope meaning high-powered incentives. If compensation is highly responsive to the outcome (in this case  $m$ ) then the typical provider will deviate. But once the typical provider also makes announcements, the agents have no way of separating the typical

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<sup>14</sup>In the context of crowding out, as discussed earlier, this can be interpreted as intrinsic motivation being strong enough.

provider's announcement from that of the motivated provider. The signal  $B$  could come from a typical provider in state  $G$ , or it could come from both types of providers in state  $B$ . Note that the agent's posterior belief  $\sigma$  is monotonic in the prior belief  $\mu$  and the fraction of typical providers  $(1 - \delta)$ . *If there are large number of typical providers and agents' belief about the underlying state being good is high, all agents will apply even when state is bad.* Hence introduction of high-power schemes leads to communication failure as shown in the corollary .

**Corollary 1** *In the presence of high-powered incentives, communication by the providers may cease to be credible and all agents will apply even in the bad state. This can happen even when the motivated providers continue to be truthful.*

### 3.4 Developmental Objectives

The above discussion has brought out the donor's objective in to focus. Why should the donor be interested in awarding the provider in terms of number of successful projects? As the complete information benchmark suggests efficiency maximzing donor would like to have all high skilled agents get the project irrespective of the state. But as we saw it is impossible to achieve. However, it is not the case that donors have to be interested in maximizing returns to every dollar spent. Suppose the donor is interested in only avoiding the worst case- low skill types undertaking the project in the bad state but has no preference over types in the good state.<sup>15</sup> Note that ex post the provider can observe the total number of failed projects. First consider the simple scenario where the donor can identify the different

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<sup>15</sup>This would of course include the case where the Donor would like the low skill agents to get the project in the good state. If wealth and skill level are positively coorrelated, one can justify such objectives.

failed types.<sup>16</sup> Consider a compensation scheme

$$Z = \bar{z} \text{ if } n_{lB}^* = 0, Z = \underline{z} < \bar{z} \text{ otherwise} \quad (14)$$

This compensation scheme will not change the motivated provider's incentives. One can choose  $\bar{z}, \underline{z}$  suitably so that  $U(e = 1) \geq U(e = 0)$  and  $U(e = 1) \geq \bar{U}$ . What about the typical provider? Now the typical provider cares about the low skill types only in the bad state and its interests are aligned with those of the low skill types. There is an equilibrium with

$$\begin{aligned} e_M^* &= 1, e_T^* = 1, s^M(G) = s^T(G) = G, s^M(B) = s^T(B) = B \\ a_h &= A, a_l(G) = A, a_l(B) = NA \end{aligned} \quad (15)$$

Hence communication is effective, in the good states both types apply and the provider will randomly choose projects. In the bad state only the high skill types apply and  $n_h^* = \frac{M}{T}$ .<sup>17</sup>

## 4 Conclusion

Using a very simple and stylized setting we have shown that introduction of high-powered incentives can lead to communications failure and undermine the very reasons for the introduction of incentives. In our view communication and information flows are vital to the success of many development projects like aid, microfinance and transfer of know-how. It is essential that communication between the immediate provider of services and the recipients is credible. Incentivising the providers may destroy this credibility in

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<sup>16</sup>One can argue that the informational requirements of these kinds of schemes are demanding. This requires the donor to have some kind of audit of all the failed projects.

<sup>17</sup>When  $n_h < \frac{M}{T}$  this would imply that the provider will not disburse the whole amount  $M$ . This shows that some of the input based incentives where providers are assessed in terms of the number of projects financed or amount of funds disbursed are not likely to be optimal in this case.

some settings.

While our result is related to the recent literature on intrinsic and extrinsic motivation, the emphasis on information flows and communication is a novel feature. The mechanism through which introduction of extrinsic motivations work is quite different. It does not destroy the intrinsic motivations of the motivated providers, rather it makes the typical provider active in such a way that the communication between the motivated providers and the agents breaks down.

Based on our stylized model we believe that there are two issues which need further investigation. First, we have assumed (through most of the paper) that the number of high skilled agents exceeds the number of projects that can be financed. Suppose this is not true. Then it is possible that in some states the entire amount of funds supplied by the donor will not be disbursed. Some donors who prefer full utilization (disbursement) of funds will consider this outcome inefficient. But on the other hand, in the bad state where the low skilled types are better off not undertaking the project, it is better to have undisbursed funds. We have made partial reference to this issue but have not investigated it properly.

Secondly, the provider has to always rely on random allocation if the number of applications exceed the number of projects to be financed. The only way the provider can affect the final allocation is by communicating and influencing the agents' choice to apply for projects. This restriction was imposed to keep the focus on communication. But in practice, the provider might undertake costly screening of the applications. It is obvious that costless screening will render the communication process redundant. The case of costly screening has not been explored here and has been left for future research.

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